

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 9612**

Roll No.

**B.Tech.**

(SEM II) EVEN SEMESTER THEORY EXAMINATION, 2009-2010

**ENGINEERING CHEMISTRY**

Time : 3 Hours

Total Marks : 100

Note : Attempt ALL questions.

**SECTION-A**

1. Choose / Fill correct answers : (20x1=20)

- (a) IR active compounds are those compounds which undergo a net change in \_\_\_\_\_.
- (b) Hard water does not give lather with soap because it forms \_\_\_\_\_.
- (c) Which of the intermolecular bonds are caused by induced dipoles ?  
 (i) Ionic (ii) vander Walls  
 (iii) Hydrogen (iv) Covalent
- (d) Which of the following statements about graphite is **not** correct ?  
 (i) The coordination of carbon atom is 4  
 (ii) The carbon atoms are arranged layers  
 (iii) The layers in graphite are attractive to each other by weak forces.  
 (iv) The carbon atoms use only three of their four outer electrons for covalent bonding.
- (e) Which of the following has the greatest covalent character ?  
 (i) NaCl (ii)  $MgCl_2$  (iii)  $AlCl_3$  (iv)  $SiCl_4$
- (f) Example of geometrical isomerism is :  
 (i) 2-Butanol (ii) 2-Butene  
 (iii) 2- Butanal (iv) 2- Butyne
- (g) The polymer which is used in non sticky kitchen is :  
 (i) PVC (ii) Teflon (iii) Rayon (iv) Isoprene
- (h) Bakelite is a :  
 (i) Natural polymer (ii) Additional polymer  
 (iii) Condensation polymer (iv) Homopolymer
- (i) The relationship between absorbance and transmittance is,  $A = \frac{\log I_0}{I}$ .
- (j) Hydrogen bonding in IR spectroscopy results the shifting of absorption band towards \_\_\_\_\_ wave number.
- (k) In NMR spectroscopy the number of splitted peaks =  $n+1$ , where n is the number of \_\_\_\_\_ atoms on the neighbouring \_\_\_\_\_ atoms.

- (l) The abnormal boiling point of  $H_2O$  is due to \_\_\_\_\_.
- (m) Which of the following is diamagnetic in nature ?  
 (i)  $H_2^+$  (ii)  $H_2$  (iii)  $H_2^-$  (iv) None of these
- (n) Which of the following is an example of cubic structure ?  
 (i) NaCl (ii)  $SnO_2$  (iii) ZnO (iv)  $NaNO_3$
- (o) The unit of k of zero order reaction is :  
 (i)  $time^{-1}$  (ii)  $mol\ litre^{-1}\ time^{-1}$   
 (iii)  $litre\ mol^{-1}\ time^{-1}$  (iv)  $litre^{-1}\ time^{-1}$
- (p) The \_\_\_\_\_ cells convert the energy from the combustion of \_\_\_\_\_ into the electrical energy.
- (q) Corrosion involves the \_\_\_\_\_ of iron and the formula of rust is \_\_\_\_\_.
- (r) The following reaction is known as :  

$$Ketoxime \xrightarrow{H_2SO_4} N\text{-substituted amide}$$
 (i) Aldol condensation (ii) Beckmann rearrangement  
 (iii) Diels-Alder Reaction (iv) Hoffmann rearrangement
- (s)  $Et_3Al \cdot TiCl_3$  is known as \_\_\_\_\_.
- (t) The titration of ferrous ammonium sulphate versus potassium dichromate is known as \_\_\_\_\_ titration.
- (u) The major component of bio-gas is \_\_\_\_\_.

## SECTION-B

2. Attempt any three of the following : (3×10=30)
- (a) (i) Explain the bonding and antibonding molecular orbitals and differentiate between them.  
 (ii) Write the electronic configurations of  $N_2$ ,  $N_2^+$ ,  $N_2^-$  and  $N_2^{2-}$ . Establish their stability order based on calculation of bond order. Also write their magnetic character.
- (b) (i) Derive the equation for half life of a first order reaction.  
 (ii) Define EMF of a cell and write a short note on electrochemical cell.
- (c) (i) Describe preparation, properties and applications of :  
 (A) Buna-N  
 (B) Nylon -6, 6  
 (ii) Discuss in brief the diastereomers and meso compounds with suitable examples.
- (d) (i) Distinguish between thermosetting and thermoplastic resins. Classify the following as thermosetting and thermoplastic :  
 Polystyrene, polyethylene, urea-formaldehyde, bakelite, teflon and nylon.  
 (ii) Discuss the zeolite process for removing the hardness of water.
- (e) (i) Two organic compounds have same molecular formula  $C_2H_6O$ . In NMR spectra one shows only one signal while the other has three signals. Identify them with proper explanation.  
 (ii) Write a short note on Bragg's law.

## SECTION-C

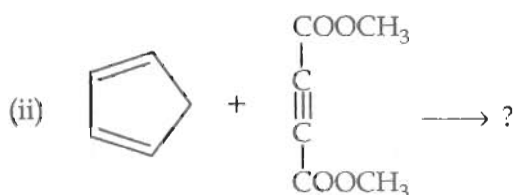
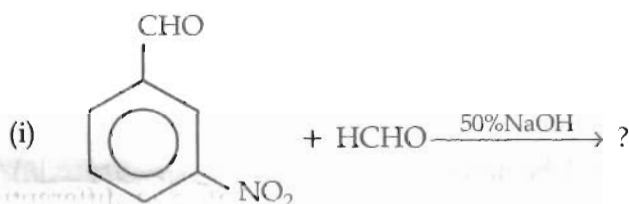
(5×10=50)

3. Attempt any one of the following :

- Explain Beer Lambert Law. Discuss Electronic transitions. Calculate absorbance if %T=80.
- Write the various regions in IR spectrum. Discuss the fingerprint region. Determine the structure of the compound,  $C_3H_6O$  showing the following absorption bands in IR spectrum; (i)  $2950\text{ cm}^{-1}$  and (ii)  $1720\text{ cm}^{-1}$ . The compound gives negative test with Tollen's reagent.

4. Attempt any one of the following :

- Describe the various types of liquid crystals. Distinguish between nematic and smectic liquid crystals.
- Complete the following reactions and write their mechanism



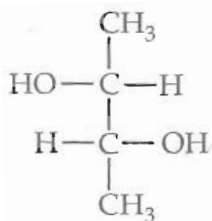
Write one application of the above named reactions.

5. Attempt any one of the following :

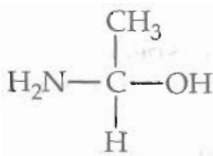
- Explain the terms: component, phase and degree of freedom with the help of phase diagram of water. Calculate the degree of freedom at triple point.
- Differentiate between addition and condensation polymers. Identify the monomers in the compounds : Neoprene; Dacron; Nylon 6, 6; Polytetrafluoroethylene (PTFE). And also explain conducting polymers with their applications.

6. Attempt any one of the following :

(a) (i) Assign (R) or (S) configuration to the following compounds :

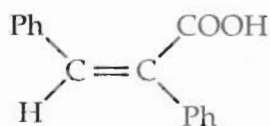


(A)

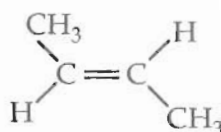


(B)

(ii) Assign E or Z configuration to the following compounds :



(A)



(B)

(iii) Describe the conformational isomers of n-Butane.

(iv) The following compounds are optically active or not ? Explain.

(A) 1, 3-Diphenyl propadiene

(B) 1, 7-Dicarboxylspirocycloheptane

(b) Deduce the kinetic equation for the reaction of the first order. A first order reaction is 25% completed in 30 min. Calculate (i) rate constant (ii) half life time and (iii) time required for 75% of the reaction to be completed.

7. Attempt any one of the following :

(a) (i) Write the relationship between high and low calorific values. If HCV of a coal sample is 7500 cal/g and % H=5. Calculate its LCV. Given; latent heat of condensation of steam=580 cal/g.

(ii) Discuss the problems created by hard water in boiler. A sample of hard water has a hardness 500ppm. Express the hardness in °French and °Clark.

(b) What are fullerenes ? Discuss their applications.

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